## AMENDMENTS TO THE CLAIMS

1. (currently amended) An apparatus for magnetic resonance imaging, comprising:

a degenerate birdcage coil having a pair of opposing rings and a plurality of rungs positioned circumferentially around said pair of rings;

input excitation circuitry for applying excitation radio frequency (RF) energy to said degenerate birdcage coil at a first resonance mode thereof; and

output receiving circuitry for receiving RF energy emitted by an object positioned within said degenerate birdcage coil, said output receiving circuitry receiving said emitted RF energy at a plurality of resonance modes at a single frequency of said degenerate birdcage coil, including said first resonance mode;

wherein said output receiving circuitry is configured to independently read each of said plurality of resonance modes with respect to one another.

2. (original) The apparatus of claim 1, wherein said input excitation circuitry includes one or more phase shifting splitters for sinusoidally applying said excitation RF energy to one or more of said plurality of rungs.

3. (original) The apparatus of claim 2, wherein said output receiving circuitry includes one or more combiners for combining said emitted RF energy from one or more of said plurality of rungs.

4. (original) The apparatus of claim 3, wherein said one or more combiners include phase shifting combiners.

5. (original) The apparatus of claim 4, wherein said degenerate birdcage coil is configured as a phased array by combining said emitted RF energy at each of said plurality of resonance modes.

6. (original) The apparatus of claim 4, wherein each of said plurality of resonance modes is used for sensitivity encoding (SENSE).

7. (previously presented) A degenerate birdcage resonator for magnetic resonance imaging, comprising:

a pair of opposing rings and a plurality of rungs positioned circumferentially around said pair of rings;

means for applying excitation radio frequency (RF) energy to the degenerate birdcage resonator such that a homogeneous RF field is established within the degenerate birdcage resonator; and

means for independently reading each of a plurality of resonance modes of RF energy at a single frequency received by the degenerate birdcage resonator from an object placed therewithin.

8. (original) The degenerate birdcage resonator of claim 7, wherein said means for applying excitation radio frequency (RF) energy to the degenerate birdcage resonator further comprises one or more phase shifting splitters for sinusoidally applying said excitation RF energy to one or more of said plurality of rungs.

9. (original) The degenerate birdcage resonator of claim 8, wherein said means for independently reading each of a plurality of resonance modes of RF energy received by the degenerate birdcage resonator further comprises one or more combiners for combining said emitted RF energy from one or more of said plurality of rungs.

10. (original) The degenerate birdcage resonator of claim 9, wherein said one or more combiners include phase shifting combiners.

11. (original) The degenerate birdcage resonator of claim 10, wherein the degenerate birdcage resonator is configured as a phased array by combining said emitted RF energy at each of said plurality of resonance modes.

12. (original) The degenerate birdcage resonator of claim 10, wherein each of said plurality of resonance modes is used for sensitivity encoding (SENSE).

13. (currently amended) A magnetic resonance imaging (MRI) system, comprising:

a computer;

a magnet assembly for generating a polarizing magnetic field;

a gradient coil assembly for applying gradient waveforms to said polarizing magnetic field along selected gradient axes; and

a radio frequency (RF) transceiver system for applying RF energy to excite nuclear spins of an object to be imaged, and for thereafter detecting signals generated by excited nuclei of said object to be imaged, said RF transceiver system further comprising:

a degenerate birdcage coil having a pair of opposing rings and a plurality of rungs positioned circumferentially around said pair of rings;

input excitation circuitry for applying excitation radio frequency (RF) energy to said degenerate birdcage coil at a first resonance mode thereof; and

output receiving circuitry for receiving RF energy emitted by said object to be imaged, positioned within said degenerate birdcage coil, said output receiving circuitry receiving said emitted RF energy at a plurality of resonance modes at a single frequency of said degenerate birdcage coil, including said first resonance mode, said output receiving circuitry further configured to independently read each of said plurality of resonance modes with respect to one another;

wherein said RF energy received by said output receiving circuitry is processed by said computer to produce MR images of said object to be imaged.

14. (original) The MRI system of claim 13, wherein said input excitation circuitry includes one or more phase shifting splitters for sinusoidally applying said excitation RF energy to one or more of said plurality of rungs.

15. (original) The MRI system of claim 14, wherein said output receiving circuitry includes one or more combiners for combining said emitted RF energy from one or more of said plurality of rungs.

16. (original) The MRI system of claim 15, wherein said one or more combiners include phase shifting combiners.

17. (original) The MRI system of claim 16, wherein said degenerate birdcage coil is configured as a phased array by combining said emitted RF energy at each of said plurality of resonance modes.

18. (original) The MRI system of claim 16, wherein each of said plurality of resonance modes is used for sensitivity encoding (SENSE).

19. (previously presented) A method for implementing a degenerate birdcage resonator within a magnetic resonance imaging system, the method comprising:

applying excitation radio frequency (RF) energy to the degenerate birdcage resonator such that a homogeneous RF field is established within the degenerate birdcage resonator; and

independently reading each of a plurality of resonance modes of RF energy at a single frequency received by the degenerate birdcage resonator from an object placed therewithin.

20. (original) The method of claim 19, wherein said applying excitation radio frequency (RF) energy to the degenerate birdcage resonator further comprises configuring one or more phase shifting splitters for sinusoidally applying said excitation RF energy to one or more of a plurality of rungs of the degenerate birdcage resonator.

21. (original) The method of claim 20, wherein said independently reading each of a plurality of resonance modes of RF energy received by the degenerate birdcage resonator further comprises configuring one or more combiners for combining said emitted RF energy from one or more of said plurality of rungs.

22. (original) The method of claim 21, wherein said one or more combiners include phase shifting combiners.

23. (original) The method of claim 22, further comprising configuring the degenerate birdcage resonator as a phased array by combining said emitted RF energy at each of said plurality of resonance modes.

24. (original) The method of claim 22, wherein each of said plurality of resonance modes is used for sensitivity encoding (SENSE).

25. (previously presented) A method for implementing a degenerate birdcage resonator within a magnetic resonance imaging system, the method comprising:

sinusoidally applying excitation radio frequency (RF) energy to individual rungs of the degenerate birdcage resonator at a first resonance mode thereof, such that a homogeneous RF field is established therewithin; and

independently reading each of a plurality of resonance modes of RF energy at a single frequency, including said first resonance mode, received by the degenerate birdcage resonator from an object placed therewithin.

26. (original) The method of claim 25, wherein said sinusoidally applying excitation radio frequency (RF) energy to the degenerate birdcage resonator further comprises configuring one or more phase shifting splitters for sinusoidally applying said excitation RF energy to one or more of a plurality of rungs of the degenerate birdcage resonator.

27. (original) The method of claim 25, wherein:

the degenerate birdcage resonator includes eight rungs circumferentially spaced around a pair of opposing rings; and

said sinusoidally applying excitation radio frequency (RF) energy to the degenerate birdcage resonator further comprises configuring a 180 ° phase shifting splitter and a pair of 90° phase shifting splitters for sinusoidally applying said excitation RF energy to one or more of said rungs of the degenerate birdcage resonator.

28. (original) The method of claim 26, wherein said independently reading each of a plurality of resonance modes of RF energy received by the degenerate birdcage resonator further comprises configuring one or more combiners for combining said emitted RF energy from one or more of said plurality of rungs.

29. (original) The method of claim 28, wherein said one or more combiners include phase shifting combiners.

30. (original) The method of claim 28, wherein said one or more combiners include phase shifting combiners.

31. (original) The method of claim 29, wherein each of said plurality of resonance modes is used for sensitivity encoding (SENSE).